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FLOOD INSURANCE STUDY

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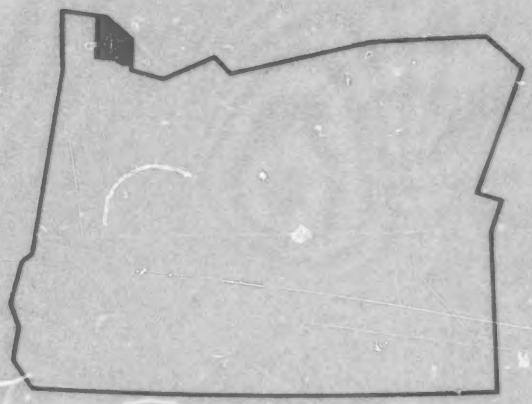
CITY OF ST HELENS, OREGON
COLUMBIA COUNTY



SEPTEMBER 29, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 410040

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of St. Helens, Columbia County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (COE), Portland District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-E-1153, Project Order No. 1, Amendment No. 3. This study was completed in June 1985.

The hydrologic and hydraulic analyses for Milton Creek were completed by the U.S. Soil Conservation Service (SCS) in June 1984 for the Milton Creek Flood Plain Management Study (Reference 1).

1.3 Coordination

An initial coordination meeting was held on June 6, 1979, and attended by representatives of FEMA and the City of St. Helens. Limits of proposed detailed-study analysis and flood problems were discussed.

A precontract coordination meeting was held on February 23, 1983, at the Columbia County Court House, in the City of St. Helens. The meeting was attended by county and city officials, and representatives from the COE and FEMA. The purpose of the meeting was

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to: (1) inform the city of its status in the NFIP; (2) gather all available pertinent data on flooding in the community; and (3) reach an agreement on the areas to be studied. Also discussed were flood hazards and possible locations of high-water marks.

An intermediate coordination meeting was held on July 22, 1985, between FEMA and the city. No problems were raised at this meeting.

The final community coordination meeting was held on December 18, 1985, and attended by representatives of FEMA, the study contractor, and the community. All problems and concerns raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of St. Helens, Columbia County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

The unincorporated area surrounding the City of St. Helens is not included in this study. It will be included in the Flood Insurance Study for Columbia County (Reference 2).

The Columbia River from River Mile (RM) 85 to RM 87, Milton Creek from RM 0.5 to RM 3.0, and McNulty Creek from RM 0.85 to RM 1.05 were studied by detailed methods.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through June 1990.

2.2 Community Description

The City of St. Helens is located near the confluence of Multnomah Channel and the Columbia River in Columbia County, approximately 22 miles northwest of Portland.

The city was founded in 1844 and, in its early years, was given various names. In 1850, it was officially platted and named St. Helens because of its proximity to Mount St. Helens. Incorporation occurred in 1889. The town's location adjacent to the river and the forested areas of Columbia County influenced development as a river and forest products center. In addition, its selection as the county seat has contributed to a large government labor force.

The economic character of St. Helens is changing from an independent forest products activity center to a more diversified one, with increased ties to the commercial/industrial base of the Portland

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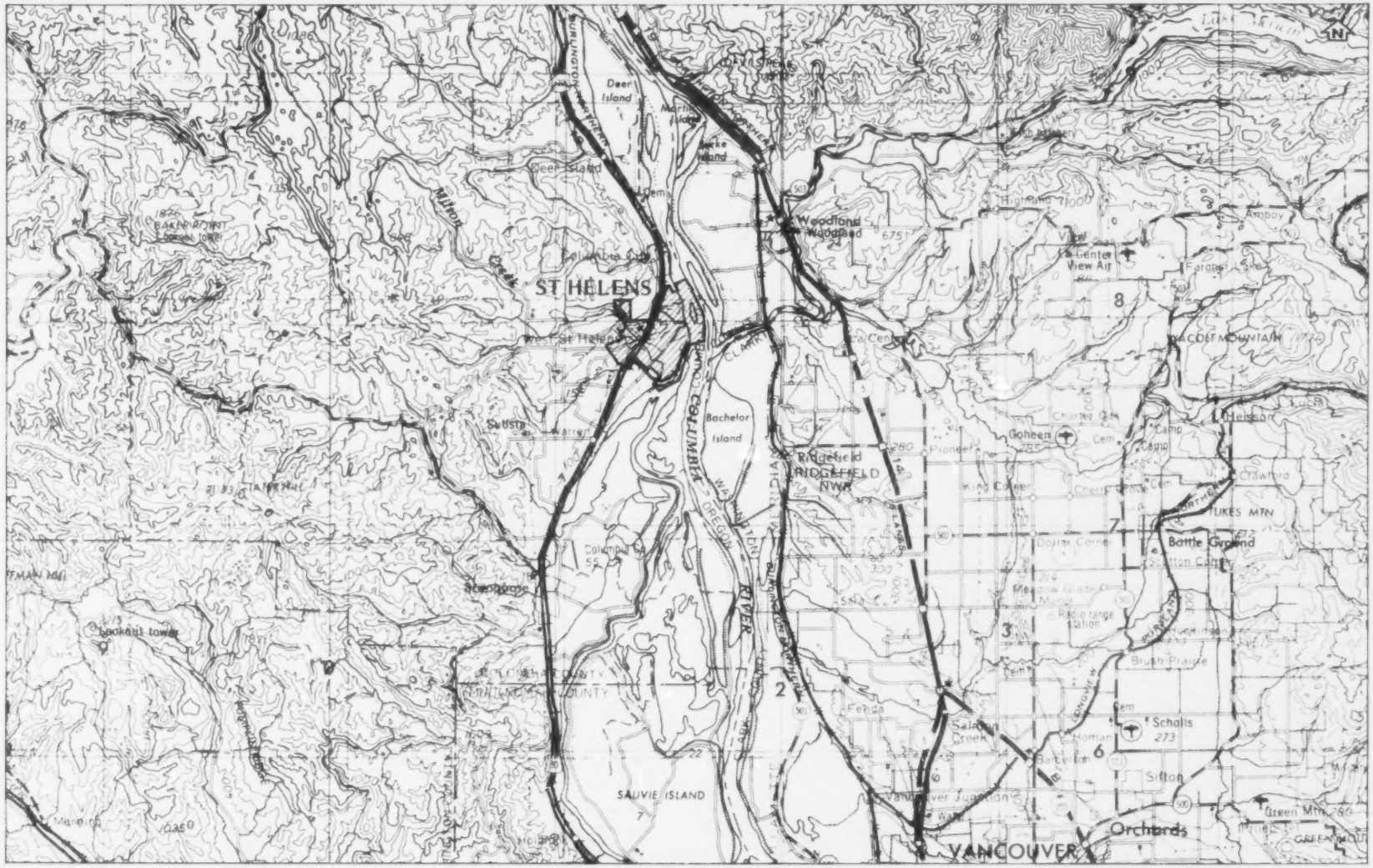

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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metropolitan area. A paper and veneer manufacturing plant is the largest private employer, and the school and hospital districts are the largest public employers. The Port of St. Helens is the second most active Oregon port, after the Port of Portland, in the issuance of bonds to finance industrial development. Agricultural products of the area include strawberries, wheat, holly, and cattle (Reference 3).

The population of St. Helens increased approximately 50 percent between 1950 and 1980, from 4,711 to 7,064, experiencing only a 1.7 percent average annual rate of growth. The population estimate for 1982 was approximately 7,200 (Reference 4).

The climate of St. Helens is characterized by mild, wet winters and dry, pleasant summers. Average annual precipitation is 45 inches. Approximately 45 percent of the precipitation occurs during the winter. Average temperatures range from 40.6°F in January to 62.4°F in July (Reference 4).

The Columbia River borders St. Helens on the east and drains an area of 254,000 square miles. The Multnomah Channel borders St. Helens on the southeast and is one of the outlets of the Willamette River to the Columbia River. The Willamette River drains an area of 11,200 square miles.

Milton Creek flows through St. Helens and drains an area of 32 square miles. Milton Creek flows through residential and commercial development between Pittsburg Road and a point approximately 1,500 feet downstream of U.S. Highway 30. Outside this reach, the creek flows through native brush and trees, except where it crosses Old Portland Road and at the outlet to Multnomah Channel, where there is industrial development. There are anadromous fish runs and spawning in Milton Creek (Reference 1).

McNulty Creek flows on the southwestern edge of St. Helens and drains an area of 8.3 square miles. Moderate streambank sedimentation, water temperature, and nuisance algae or plant problems have been experienced on McNulty Creek (Reference 5).

Much of the City of St. Helens is classified as a rockland complex by the Oregon Water Resources Board (Reference 6) and the SCS. This includes the lower part of Milton Creek below Old Portland Road and the area between the flood plains of Milton Creek and McNulty Creek from Scappoose Bay northwest to approximately 1,500 feet northwest of U.S. Highway 30. This complex consists of very shallow soil over rock or, in some cases, exposed rock, that makes other soil characteristics relatively unimportant.

The remaining area along Milton Creek for approximately 0.75 mile in each direction from U.S. Highway 30 and all the drainage basin of McNulty Creek, except for the upper part of the watershed above

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an approximate elevation of 250 feet, are silt loams of the Aloha-Quatama series. Those silt loams are very deep, somewhat poorly drained, medium-acid, water-deposited soils with very dark grayish brown, friable surface layers and brown, firm, somewhat brittle subsurface layers. In nonurban areas, the soil is used for small grains, berries, orchard crops, and forage crops (Reference 6). The most common limitation on Aloha soil is wetness. On Aloha soil, shallow excavations and dwellings with basements are rated as having severe limitations (Reference 1).

2.3 Principal Flood Problems

The principal sources of flooding in St. Helens are Milton and McNulty Creeks. Because of intense heavy rainfall in winter and early spring, flooding can occur for short periods. According to city officials, the worst flood that occurred on Milton Creek was in December 1955. Several homes were damaged in areas adjacent to the creek. Sandbagging and other emergency efforts prevented further damage.

Large floods in the vicinity of Milton Creek also occurred in December 1964 and January 1974. Both of these floods were the result of a storm with heavy rain following a period of cold weather with frozen ground (Reference 1).

Flooding from McNulty Creek is generally caused by rainfall in the winter, the period of greatest storm activity. Floods rise quickly following a heavy rainstorm and usually last less than 12 hours on McNulty Creek.

The largest recent flood on McNulty Creek occurred in December 1974. No structures located along the creek were reported flooded. Flood damage was negligible because the stream is in a ravine. Flood elevations on the lower 0.2 mile of the stream are controlled by backwater from floods on the Columbia River. Figure 2 shows the heights that would be expected from 100- and 500-year floods on McNulty Creek.

Coincident flooding of the Columbia River and Multnomah Channel can occur in late spring. Inundation of the industrial waterfront and port areas along the Columbia River is limited because of the relatively high and steep sloping banks along much of the Columbia River waterfront.

2.4 Flood Protection Measures

A system of upstream flood-control reservoirs regulate flood discharges on the Columbia River and Multnomah Channel. The Columbia River flood-control system consists of a series of 22 major flood-control storage reservoirs in both the United States and Canada, upstream of the Willamette River, with a total flood-control storage volume of approximately 40 million acre-feet (Reference 7).

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Figure 2. Possible Future Heights on McNulty Creek at Upstream Side of Railroad Bridge at RM 0.87

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In addition, there are 11 major flood-control reservoirs in the Willamette River basin, with approximately 1.7 million acre-feet of flood storage (Reference 8). Therefore, the combined total of flood storage available upstream of St. Helens is approximately 42 million acre-feet.

Flooding of the Multnomah Channel is directly related to flooding of the Columbia River. Protection from and prevention of floods along the channel are therefore governed by upstream flood-control measures on the Columbia River.

There are no flood-control structures in the Milton or McNulty Creek basins.

Nonstructural measures (flood hazard zoning ordinance and building permits) are being used to aid in the prevention of future flood damage. The zoning ordinance, which was enacted on October 3, 1978, follows the Federal guidelines for controlling development within the 100-year flood plain, by stating that all new structures must be built 1 foot above the 100-year flood level or, if commercial or industrial, they must be built to be watertight and waterproof within the flood plain (Reference 9). The city requires building permits, and reviews those permits to see whether the provisions of the flood hazard zoning ordinance have been complied with to assure that sites are reasonably safe from flooding.

Forecasts for precipitation amounts are available from the National Weather Service. Flood warnings and stage forecasts for the Columbia River are provided by the National Weather Service, River Forecast Center in Portland, Oregon. These warnings and forecasts are disseminated through the Portland Weather Service Forecast Office. No forecasts or warnings are provided for Milton or McNulty Creeks.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40

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percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

No stream-gaging stations are located on McNulty or Milton Creeks. The discharges for McNulty Creek were developed by the regional analysis presented in U.S. Geological Survey Open-File Report 79-553 (Reference 10). The discharges developed by this procedure were checked by a Meyer's rating curve prepared for northwestern Oregon for the 100-year flood.

The hydrologic analysis for Milton Creek was performed by the SCS. Because there are no stream gages on Milton Creek, the SCS developed discharge-frequency curves for nine stream gages in surrounding drainages in northwestern Oregon and southwestern Washington using the standard log-Pearson Type III statistical procedure, as described in U.S. Water Resources Council Bulletin 17B (Reference 11). Regression equations of peak discharge versus drainage area were developed for several storm frequencies using the discharge-frequency relationships for the nine gages (Reference 1).

Peak discharge-drainage area relationships for McNulty and Milton Creeks are shown in Table 1.

The stage-discharge relationship for the Columbia River near St. Helens is influenced by ocean tides. Thus, flood frequencies are more reliably determined for stages than for discharges, and combined probability stage-frequency curves were developed for several locations on the Columbia River, including one at RM 87 at St. Helens. These curves were based on the statistical combination of stage-frequency curves for fall-winter floods and spring-summer floods and used to produce combined probability stage-frequency water-surface profiles (Reference 12). Those profiles were prepared for the Flood Insurance Studies for Multnomah County, Oregon; Portland, Oregon; Clark County, Washington; and Vancouver, Washington (References 13, 14, 15, and 16, respectively). Columbia River discharges were estimated, then used in the COE HEC-2 step-backwater computer program (Reference 17), which was calibrated to reproduce the above-mentioned Columbia River flood profiles.

Elevations for floods of the selected recurrence intervals on the Columbia River are shown in Table 2.

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Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
McNulty Creek					
At Mouth	8.3	440	690	810	1,130
Milton Creek					
At Mouth	32	3,220	4,090	4,400	5,020
At Pittsburg Road (RM 5.6)	--[1]	2,070	2,630	2,830	3,230

[1]Not Available

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Table 2. Summary of Elevations

Flooding Source and Location	Drainage Area (Square Miles)	Elevation (Feet) 10-Year	50-Year	100-Year	500-Year
Columbia River Near St. Helens (RM 87)	254,000	18.5	21.8	23.0	25.6

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3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Hydraulic analyses were performed using the COE HEC-2 step-backwater computer program (Reference 17). Columbia River flood profiles for selected recurrence intervals were plotted directly from the combined stage-frequency curves previously described. Hydraulic analyses of Milton Creek were performed by the SCS for the 10-, 100-, and 500-year floods using the Water Surface Profile Computer Program (WSP2) (Reference 18).

Columbia River cross sections were based on COE condition surveys, measured by hydrographic survey methods and topographic maps (References 19 and 20). Cross sections for Milton Creek were field surveyed by the SCS in 1982. Cross sections for McNulty Creek came from a composite of channel data obtained from field surveys and overbank data taken from topographic maps (Reference 21). All bridges were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Roughness values (Manning's "n") for the channel and overbanks of McNulty and Milton Creeks were first estimated from field observation. The "n" values for McNulty Creek were then verified using high-water marks from previous floods. The final calibrated "n" values for McNulty Creek varied from 0.030 to 0.150 for the channel, and from 0.150 to 0.154 for the overbanks. The roughness values determined by field analysis for Milton Creek ranged from 0.035 to 0.085 for the channel and from 0.030 to 0.125 for the overbanks.

The roughness values of the Columbia River were estimated based on engineering judgment and adjusted to calibrate the computer model to match the combined probability flood profiles. The roughness value for the main channel of the Columbia River in the vicinity of St. Helens was 0.03, and for the overbank the values ranged from 0.05 to 0.08.

Starting water-surface elevations for McNulty Creek were based on normal-depth calculations. Starting elevations at the mouth of Milton Creek were obtained from COE data for the Columbia River. The starting elevations for the Columbia River flood profiles were based on the appropriate combined stage-frequency curve.

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The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at scales of 1:4,800, 1:5,000, and 1:24,000, with contour intervals of 4, 5, and 10 feet, respectively (References 19, 20, and 21, respectively).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year flood plain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

Approximate 100-year flood plain boundaries in some portions of the study area were taken directly from Flood Hazard Boundary Maps for the city and county (References 22 and 23, respectively).

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4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the flood plain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 3). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary is shown.

Portions of the floodways of the Columbia River, McNulty Creek, and Milton Creek are outside of the incorporated area of St. Helens.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 3.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
McNulty Creek								
A	0.92[1]	35/10[2]	158	4.9	79.4	79.4	79.4	0.0
Milton Creek								
C	9,680[3]	57	483	9.1	75.6	75.6	76.6	1.0
D	10,580[3]	120	614	7.2	83.2	83.2	83.7	0.5
E	11,830[3]	46	366	12.0	94.8	94.8	95.8	1.0
F	12,144[3]	85	351	12.5	101.3	101.3	101.3	0.0
G	12,310[3]	95	718	6.1	101.8	101.8	102.8	1.0
H	12,590[3]	93	800	5.5	102.4	102.4	102.9	0.5
I	12,740[3]	122	521	8.5	102.7	102.7	102.7	0.0
J	13,210[3]	115	502	8.8	107.3	107.3	107.8	0.5
K	14,360[3]	59	363	12.1	124.5	124.5	125.5	1.0
L	15,315[3]	89	550	8.0	131.5	131.5	132.0	0.5

[1]Miles Above Mouth [2]Width/Width Within Corporate Limits [3]Feet Above Mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

FLOODWAY DATA

MCNUTLY CREEK-MILTON CREEK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Columbia River								
A	85.2	2,800/ 1,970	153,458	5.3	22.5	22.5	23.1	0.6
B	85.7	3,000/ 2,230	163,500	5.1	22.6	22.6	23.2	0.6
C	86.3	3,380/ 2,230	183,416	4.7	22.8	22.8	23.5	0.7
D	86.8	3,300/ 800	136,691	4.9	22.9	22.9	23.6	0.7

[1]Miles Above Mouth [2]Width/Width Within Corporate Limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

FLOODWAY DATA

COLUMBIA RIVER

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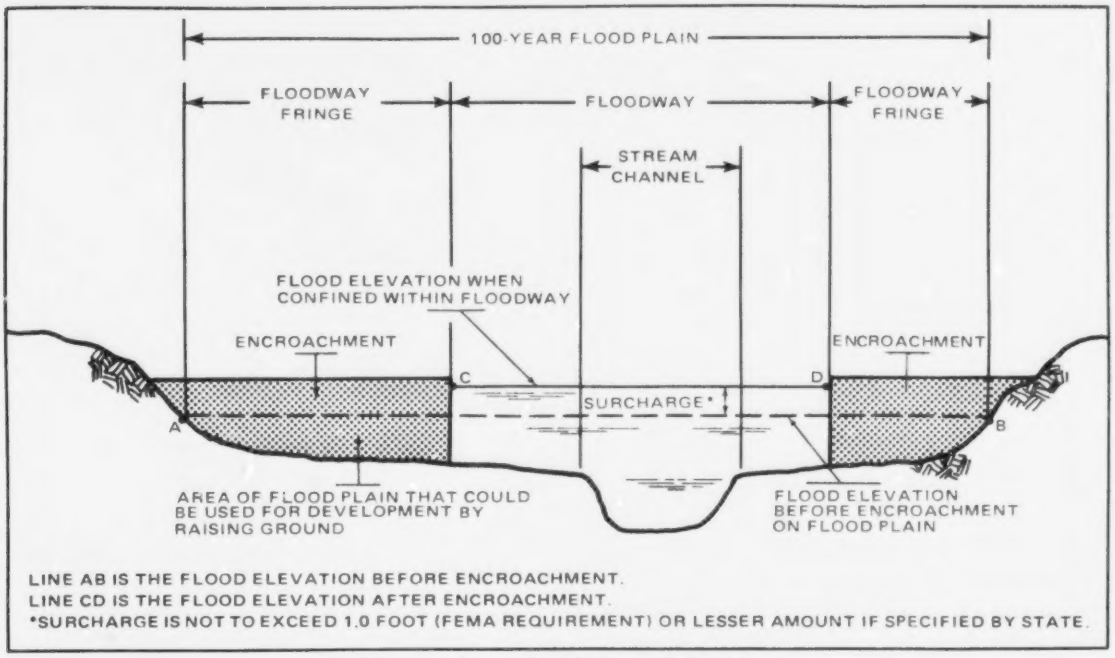
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 3. Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown in this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less

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than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year flood plains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study is being prepared for the unincorporated areas of Columbia County (Reference 2), including the area surrounding St. Helens. The results of this study and the Columbia County study will be in agreement.

The northeastern corporate limits of St. Helens extend to the middle of the Columbia River. Adjacent to this boundary is the unincorporated areas of Cowlitz County in Washington, for which a Flood Insurance Study has been published (Reference 24). This study represents a more detailed analysis.

A COE, Portland District, flood hazard study for the Columbia River in the vicinity of the Lewis River contained data in the form of water-surface profiles, floodway data, and other flood plain data (Reference 25). A portion of the information developed for the 9-mile reach covered in that study was used in this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98021-9796.

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9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Agriculture, Soil Conservation Service, Flood Plain Management Study, Milton Creek, Columbia County, Oregon, June 1984

2. Federal Emergency Management Agency, Flood Insurance Study, Columbia County, Oregon (Unincorporated Areas), unpublished

3. City of St. Helens, Chamber of Commerce, Community Information Scappoose/St. Helens, 1983

4. Secretary of State, Oregon Blue Book 1983-84, Norma Paulus, 1984

5. Columbia County, Comprehensive Plan, adopted August 1984

6. Oregon Water Resources Board, Willamette Drainage Basin, General Soil Map Report, 1969

7. U.S. Department of the Army, Corps of Engineers, Portland District, Rivergate-North Portland Area, Flood Control Study, Feasibility Report, January 1976

8. Pacific Northwest River Basins Commission, Columbia-North Pacific Region Comprehensive Frame Work Study, June 1971

9. City of St. Helens, Comprehensive Plan and Zoning Ordinance, adopted April 4, 1983

10. U.S. Department of the Interior, Geological Survey, Open-File Report 79-553, Magnitude and Frequency of Floods in Western Oregon, 1979

11. U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, September 1981

12. U.S. Department of the Army, Corps of Engineers, Portland District, "Columbia River, Combined Probability Flood Frequency Profiles, Mouth to Bonneville Dam," October 1979

13. Federal Emergency Management Agency, Flood Insurance Study, Multnomah County, Oregon (Unincorporated Areas), 1981

14. Federal Emergency Management Agency, Flood Insurance Study, City of Portland, Oregon, Revised January 3, 1986

15. Federal Emergency Management Agency, Flood Insurance Study, Clark County, Washington (Unincorporated Areas), 1982

16. Federal Emergency Management Agency, Flood Insurance Study, City of Vancouver, Washington, 1981

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17. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976, updated May 1982

18. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP2 Computer Program

19. U.S. Department of the Army, Corps of Engineers, Portland District, McNulty Creek Flood Plain Topography Map, Scale 1:4,800, Contour Interval 4 feet, March 1984

20. U.S. Department of the Army, Corps of Engineers, Portland District, Columbia River below Portland, Oregon, Topographic Maps, Drawing Numbers CL-52-I/15 to 19, Scale 1:5,000, Contour Interval 5 feet, 1963

21. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Deer Island, Oregon (1954), Photorevised (1970); St. Helens, Oregon (1954), Photoinspected (1975)

22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of St. Helens, Oregon, Scale 1:12,000, Revised April 23, 1976

23. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Columbia County, Oregon (Unincorporated Areas), Scale 1:24,000, August 23, 1977

24. Federal Emergency Management Agency, Flood Insurance Study, Cowlitz County, Washington (Unincorporated Areas), 1980

25. U.S. Department of the Army, Corps of Engineers, Portland District, Flood Plain Information, Columbia River, Vicinity of Lewis River, RM 77.7 to 86.8, Photo Plan-Profile Sheet, Scale 1:12,000, June 1980

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Exhibit 3 - Elevation Reference Marks

REFERENCE MARK	FIRM PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM1	0001	66.56	Brass disc set on concrete railing base, Old Portland Road and north side of Milton Creek and east side of bridge. Established by U.S. Soil Conservation Service.
RM2	0001	98.84	Disc stamped "98 S103 1929," in top of the curb, 0.2 mile southwest of the Burlington Northern Railway station on Columbia River Highway (U.S. 30) approximately 800 feet south of the main intersection, at the south east corner of the highway bridge over Milton Creek. Established by Oregon State Highway Division.
RM3	0001	107.07	Brass disc set in concrete railing base, Columbia Boulevard at Milton Creek, northeast corner of bridge. Established by U.S. Soil Conservation Service.
RM4	0001	139.06	Brass disc, Pittsburg Road at Milton Creek, northeast corner of bridge. Established by U.S. Soil Conservation Service.
RM5	0001	42.10	Disc stamped "NO 3 1940," in top of the east end of the circular concrete base of the flagpole, in the center of a small park west of the county courthouse. Established by U.S. Geological Survey.

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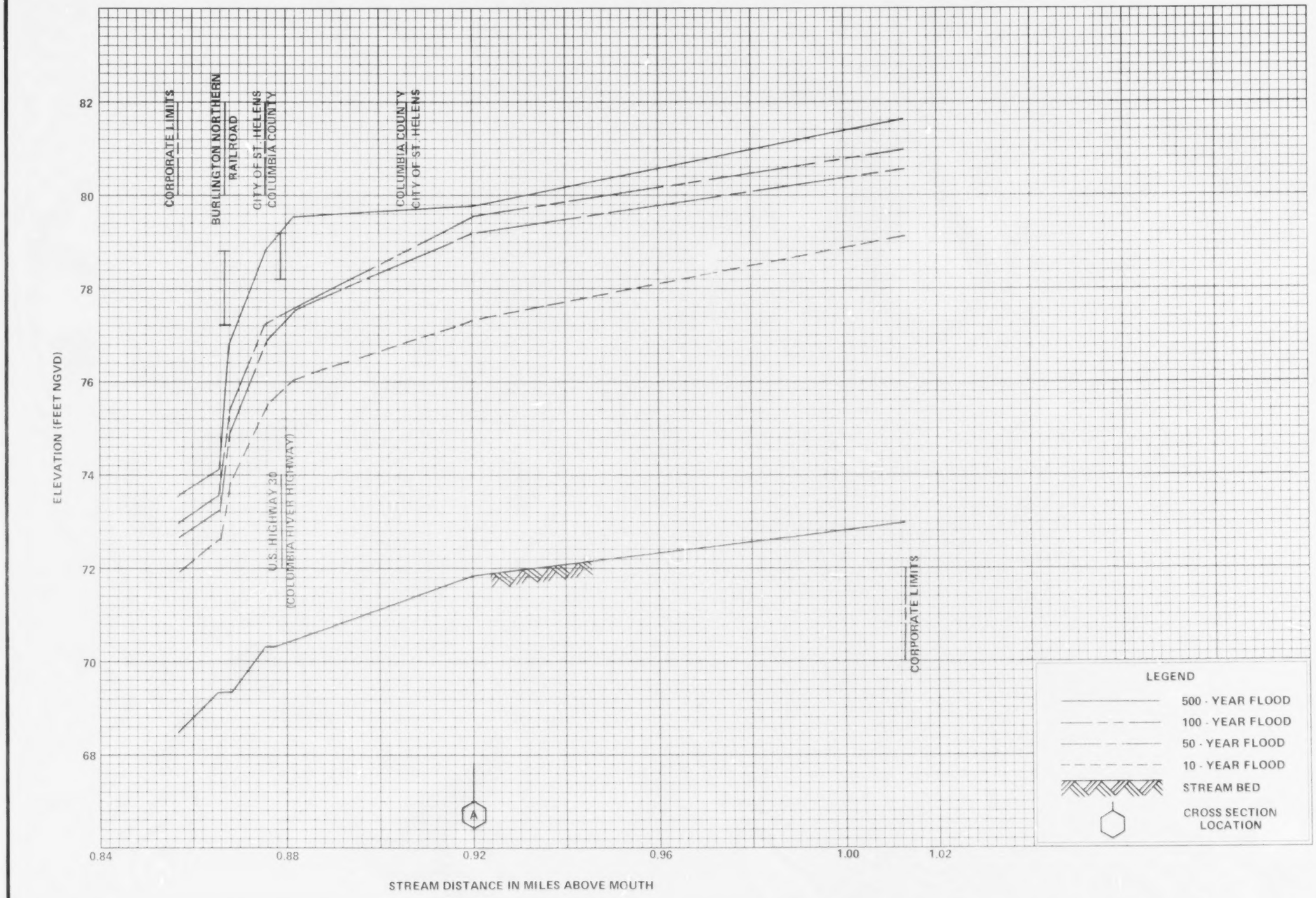

FLOOD PROFILES

MCNULTY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

01P

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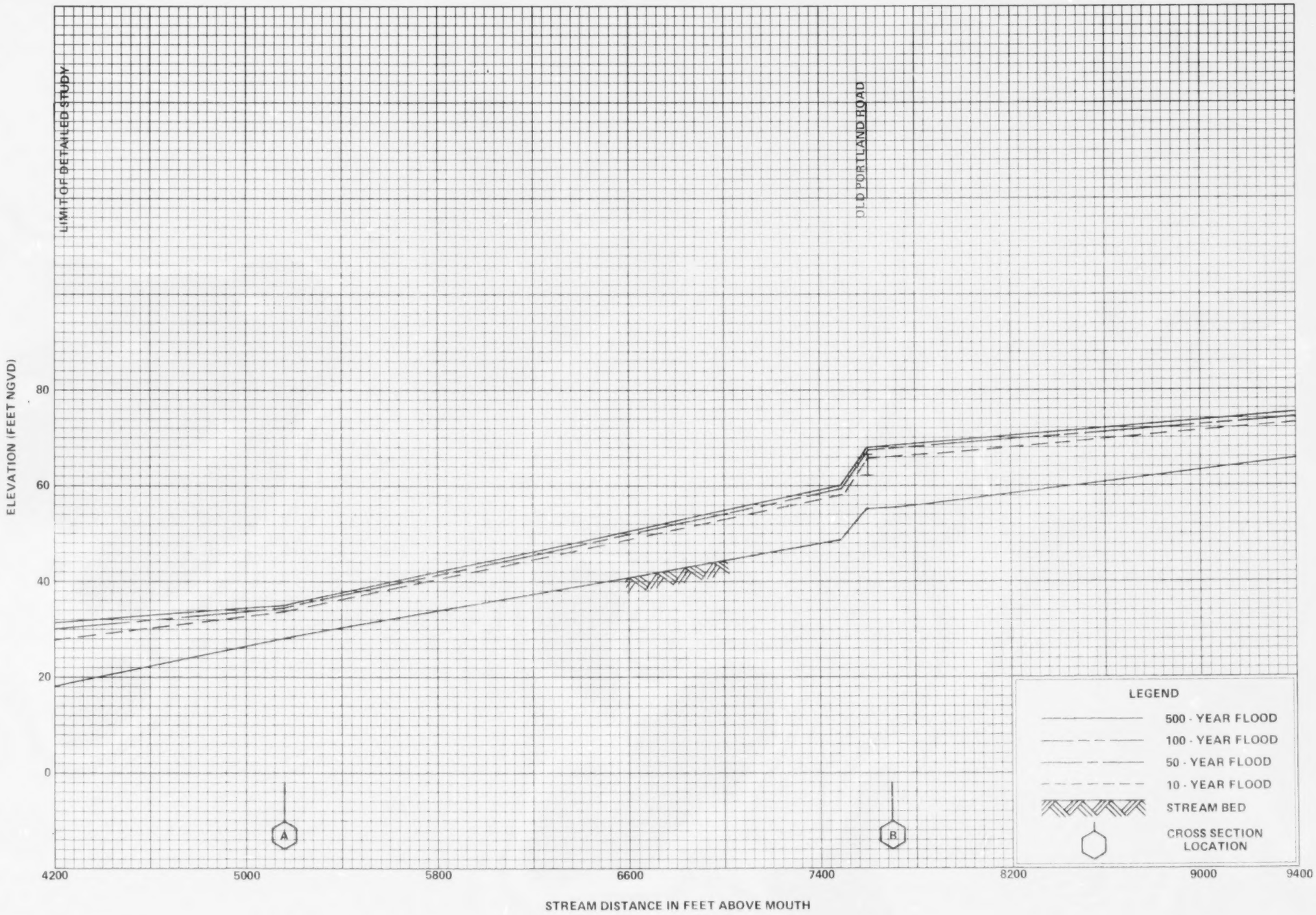

FLOOD PROFILES

MILTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

02P

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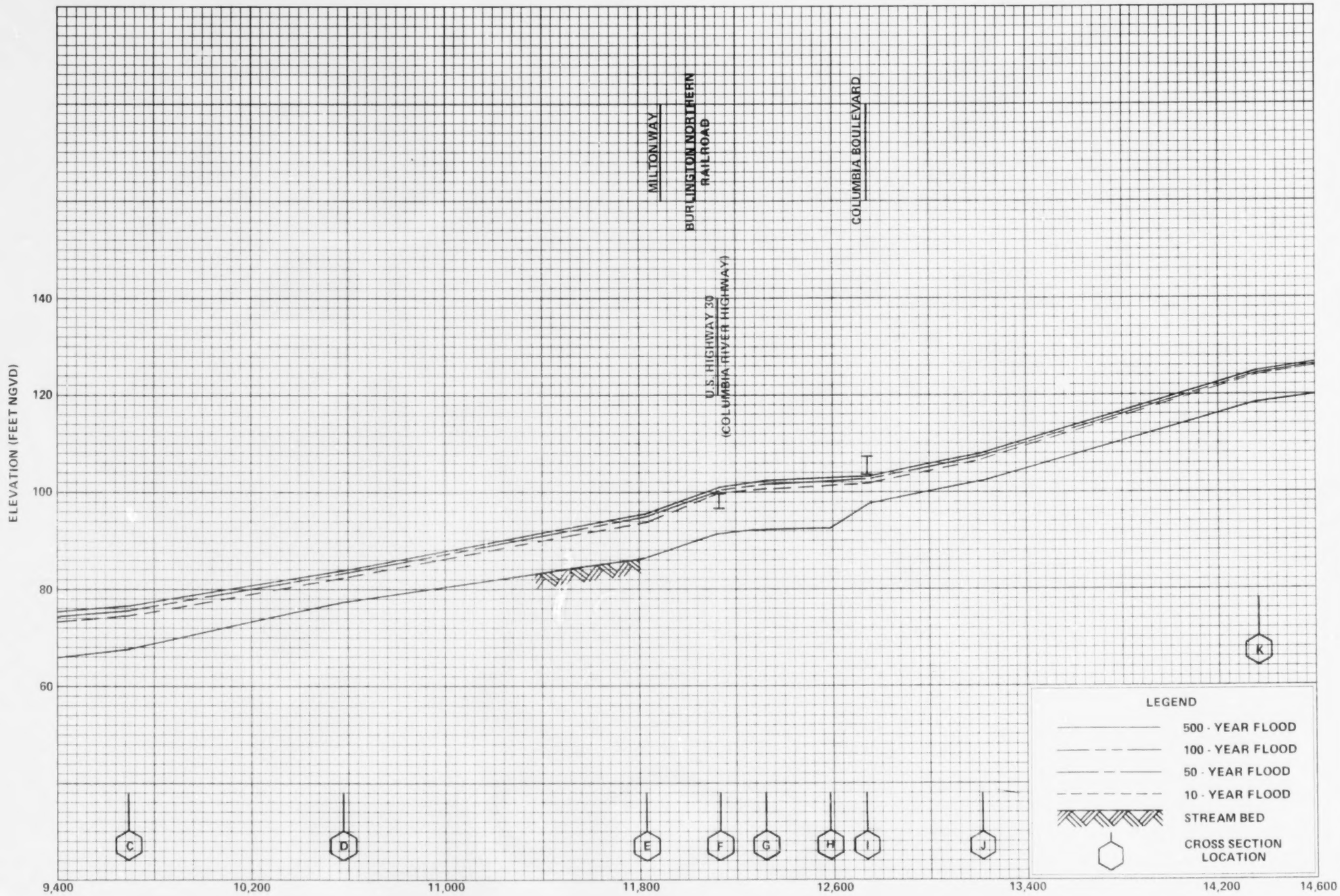

FLOOD PROFILES

MILTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

03P

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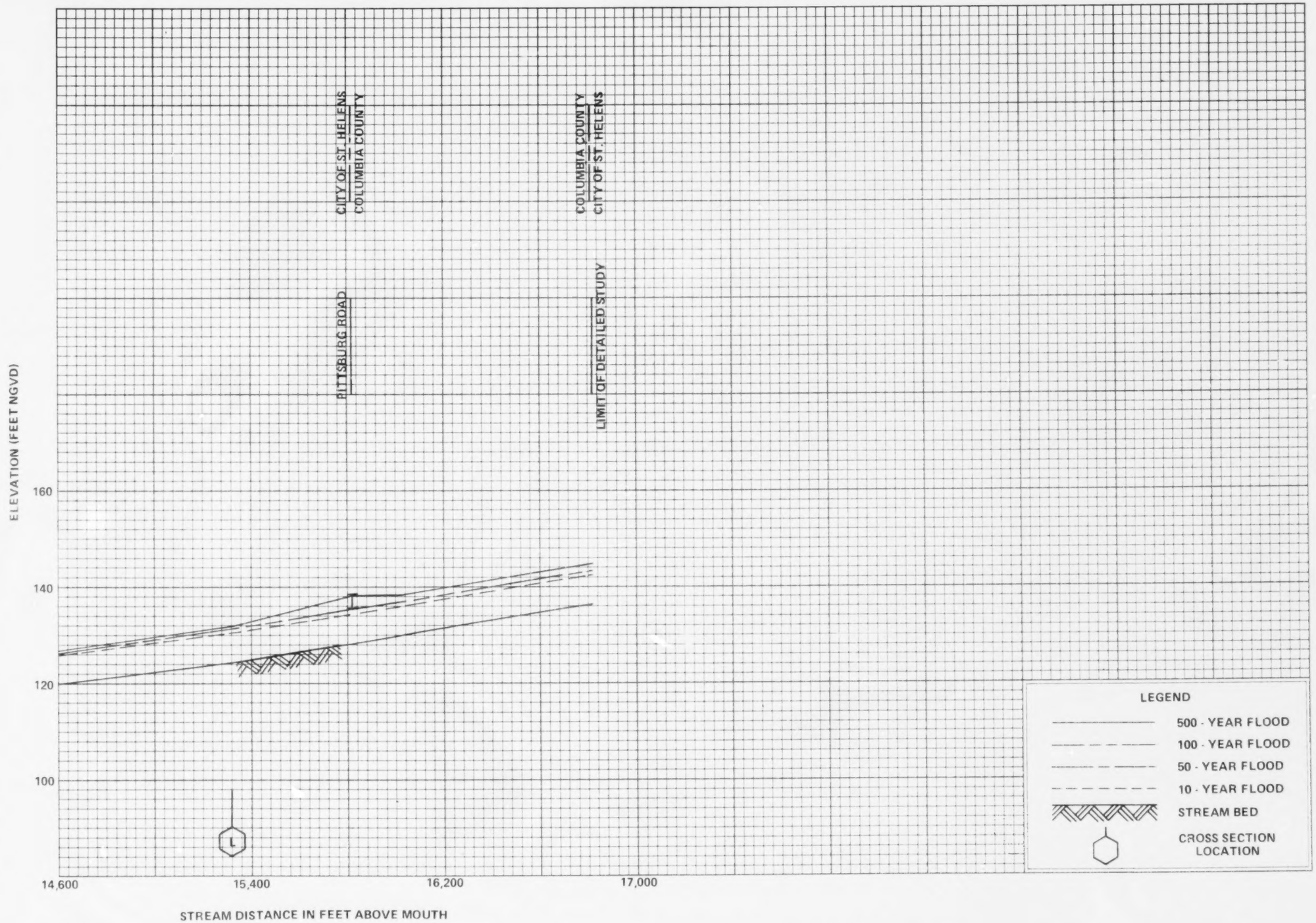

FLOOD PROFILES

MILTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ST. HELENS, OR
(COLUMBIA COUNTY)

04P

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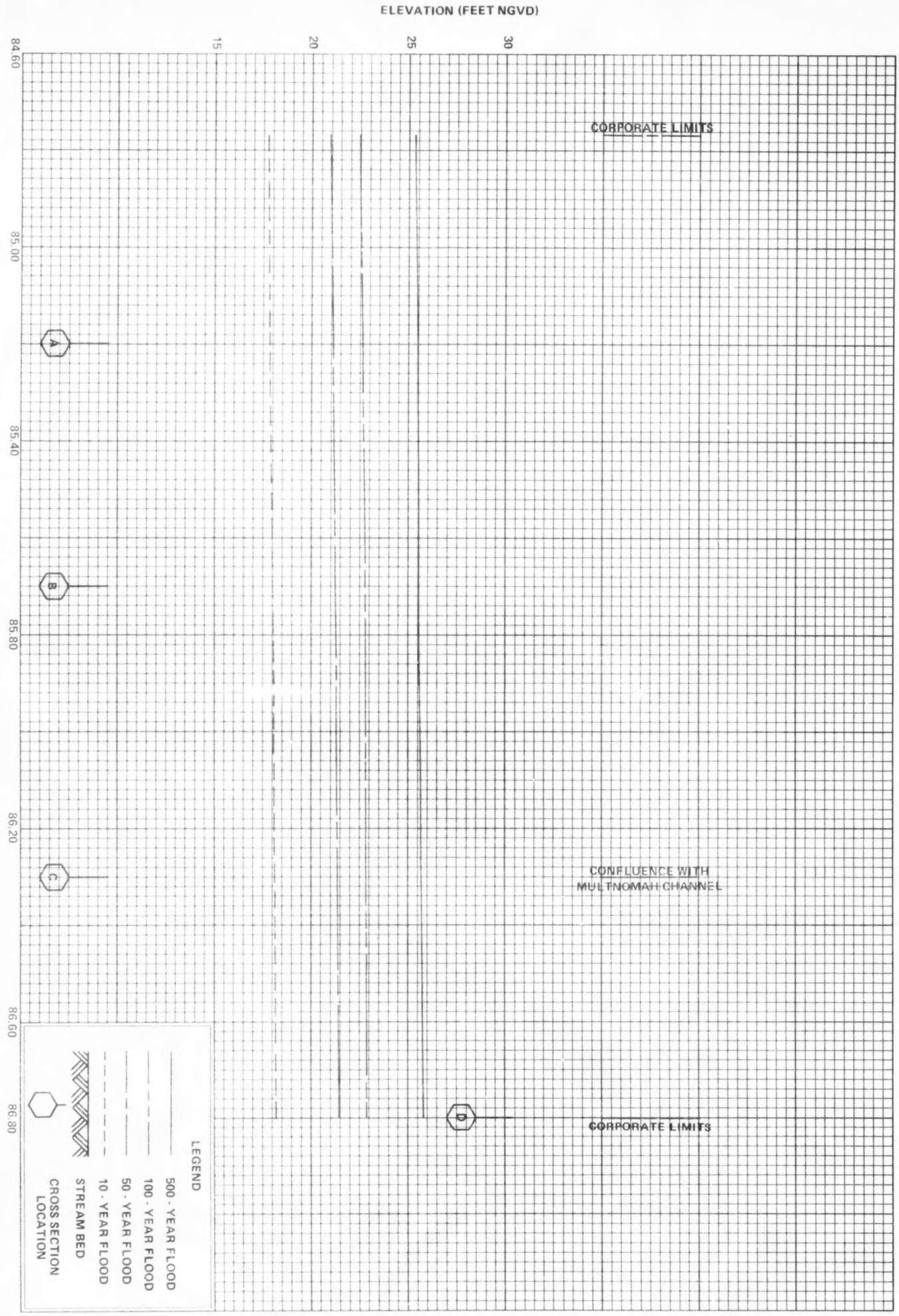

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05P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF ST. HELENS, OR (COLUMBIA COUNTY)	FLOOD PROFILES COLUMBIA RIVER